

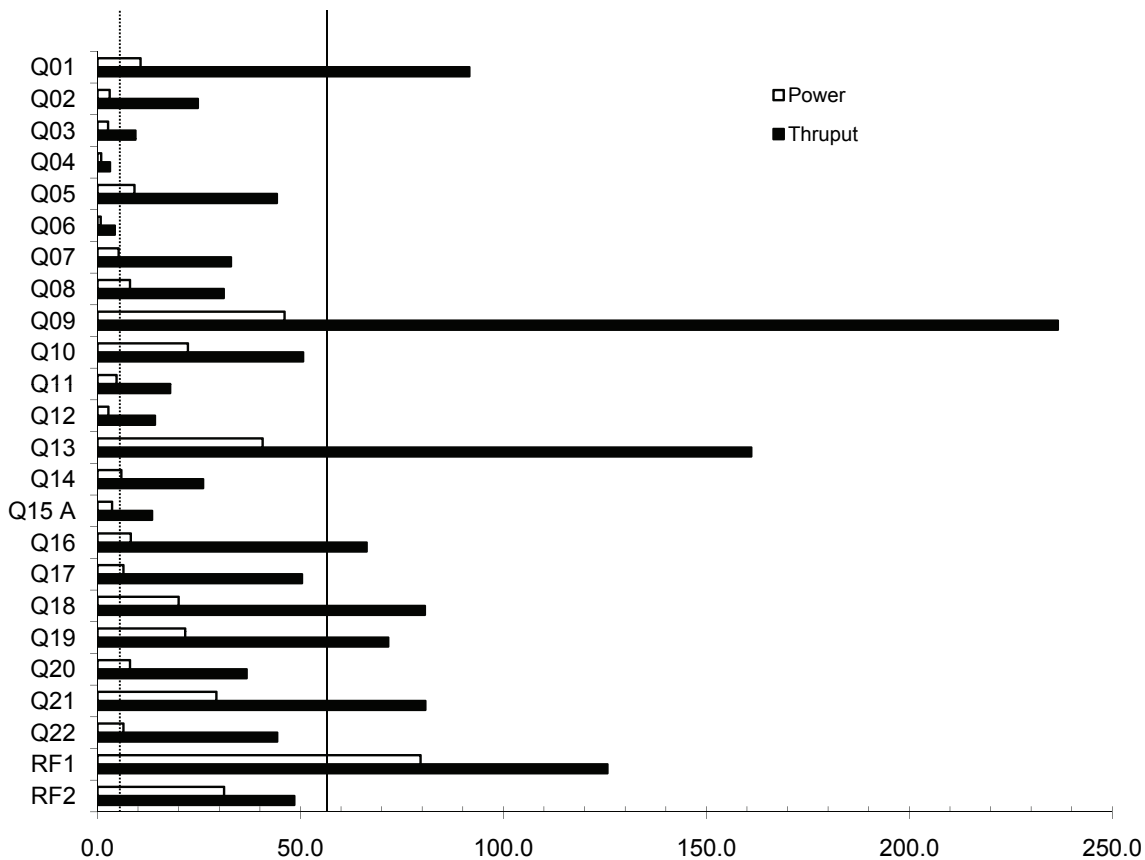
Dell PowerEdge R910 using VectorWise 1.6

TPC-H Rev 2.14.0
TPC Pricing Rev 1.6.0

Report Date:
May 3, 2011

Total System Cost	Composite Query per Hour Metric		Price/Performance	
\$384,935 USD	436,788.9		\$0.88 USD	
	QphH@1000GB		Price/QphH@1000GB	
Database Size	Database Manager	Operating System	Other Software	Availability Date
1000 GB	VectorWise 1.6	RedHat Enterprise Linux 6.0	None	6/30/2011

Geometric mean 8.5 Arithmetic Mean 54.2



Database Load Time = 15:39:54

Load Includes Backup: N

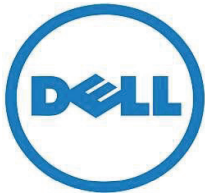
Total Data Storage/Database Size = 2.34

Memory/Database Size Percentage = 102.4%

Storage Redundancy Level 1 for Base Tables, Auxiliary Data Structures, DBMS temporary space, and OS and DBMS Software

System Configuration

Number of Nodes: 1
 Processors/Cores/Threads/Type: 4/32/32/Intel Xeon E7-8837 2.67 Ghz, 24MB L3 cache
 Memory: 1024 GB
 Disk Controller: Dell PERC H700 RAID Controller with 1GB NVRAM Cache on-board
 Disk Drives: 16 x 146GB 2.5in SAS 6Gb/s 15k rpm internal
 Total Disk Storage: 2336GB
 LAN Controllers: 4 x 1Gb Ethernet on-board



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Description	Part Number	Source	Reference Price	Qty	Extended Price	3 yr Maint Price
Server Hardware						
R910 Chassis for 16 2.5" HDD & Intel E7 Processors	225-1158	1	\$2,954.00	1	\$2,954.00	included
2x Intel® Xeon® E7-8837 2.67Gz 24MB Cache	317-7086	1	\$6,078.00	1	\$6,078.00	
Upgrade to 4 Intel® Xeon® E7-8837 2.67GHz 24MB Cache	317-7097	1	\$6,078.00	1	\$6,078.00	
1TB Memory (64x16GB) 1066MHz, Perf Optimized	317-7171	1	\$51,834.00	1	\$51,834.00	
Memory Riser PER910, Qty 8	331-2767	1	\$1,596.00	1	\$1,596.00	
Red Hat Enterprise Linux 6.0 ,Factory Install, x64	421-5717	1	\$0.00	1	\$0.00	
Red Hat Enterprise Linux,4SKT,3yr Subscription	421-5730	1	\$4,679.00	1	\$4,679.00	
Red Hat Enterprise Linux 6,Media Only X86_64	421-5737	1	\$0.00	1	\$0.00	
PERC H700 Integrated RAID Controller, 1GB NV Cache	342-1571	1	\$799.00	1	\$799.00	
RAID 5 for PERC H700 Controller	342-0392	1	\$0.00	1	\$0.00	
High Output Power Supply (1100W), Redundant	330-7498	1	\$1,196.00	1	\$1,196.00	
146GB 15K RPM SAS 6Gbps 2.5in Hard Drive	342-0427	1	\$359.00	16	\$5,744.00	
Dual Two-Port Embedded Broadcom NetXtreme 5709	330-7444	1	\$299.00	1	\$299.00	
Sliding Rails Without Cable Management Arm	330-9420	1	\$169.00	1	\$169.00	
DVD-ROM, SATA	313-9126	1	\$30.00	1	\$30.00	
Dell Keyboard, USB, Black, English	331-2254	1	\$10.00	1	\$10.00	
Optical Mouse, Two Buttons, USB, Black	331-0846	1	\$9.00	1	\$9.00	
Dell E170S 17in LCD Monitor, VGA Only	320-8083	1	\$149.00	1	\$149.00	
3 Year ProSupport and Mission Critical 4HR 7x24	923-6692	1	\$1,067.00	1	\$1,067.00	
PSMC TECH SPT,PER910,3 YR	923-6882	1	\$1,575.00	1	\$1,575.00	
PSMC 4H7X24 OS,PER910,UNY,INIT	926-9840	1	\$333.00	1	\$333.00	
HW WRTY + SVC,PER910,UNY,INIT	909-3537	1	\$280.00	1	\$280.00	
HW WRTY + SVC,PER910,UNY,EXT	909-3558	1	\$419.00	1	\$419.00	
PSMC MISSION CRIT SVC,PER910,3YR	909-3608	1	\$324.00	1	\$324.00	
Dell Discount 30%					-\$25,686.60	
				Subtotal	\$59,935.40	\$0.00
No External Storage Required						
Server Software						
VectorWise 1.6 3-year license Dell server**	ING-VW-3Y-GB-DELL	2	\$250.00	1,000	\$250,000.00	
VectorWise 1-year maintenance bug fixes**	ING-VW-3Y-GB-DELL-MNT	2	\$25.00	3,000		\$75,000.00
				Subtotal	\$250,000.00	\$75,000.00
				Total	\$309,935.40	\$75,000.00

*All discounts are based on US list prices and for similar quantities and configurations.

** These components are not immediately orderable. See FDR for more information.

Source 1=Dell: Pricing may be verified by calling 1-800-BUY-DELL, contact:
Gregory Olsen, Greg_Olsen@Dell.com, referencing quote #582792206.

2=Ingres: Pricing may be verified by calling 1-650-587-5538, contact:
Mark Van de Wiel, mark.vandwiel@ingres.com.

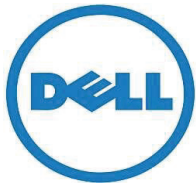
Audited By: Steve Barrish for Performance Metrics, Inc.

3-yr Cost of Ownership: \$384,935.40

QpH@1000GB: 436,788.9

\$/QpH@1000GB: \$0.88

Prices used in TPC benchmarks reflect actual prices a customer would pay for a one-time purchase of the stated components. Individually negotiated discounts are not permitted. Special prices based on assumptions about past or future purchases are not permitted. All discounts reflect standard pricing policies for the listed components. For complete details, see the pricing sections of the TPC benchmark specifications. If you find the stated prices are not available according to these terms, please inform the TPC at pricing@tpc.org. Thank you.



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Measurement Results

Database Scaling (SF/size)	1000
Total Data Storage/Database Size	2.34
Memory/Database Size Percentage	102.40%
Start of Database Load Time	04/25/11 21:06:54
End of Database Load Time	04/26/11 12:46:48
Database Load Time	15:39:54
Query Streams for Throughput Test (S)	7
TPC-H Power	422,485.9
TPC-H Throughput	451,576.1
TPC-H Composite Query-per-Hour Metric (QpH@1000GB)	436,788.9
Total System Price Over 3 Years	384,935
TPC-H Price/Performance Metric (\$/QpH@1000GB)	0.88

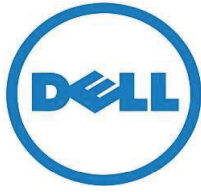
Measurement Intervals

Measurement Interval in Throughput Test (Ts)	1,228
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Duration of Stream Execution:

Power Run	Seed	Query Start Time	Duration (sec)	RF1 Start Time	RF2 Start Time
		Query End Time		RF1 End Time	RF2 End Time
	426124648	04/26/11 15:06:36	266	04/26/11 15:05:16	04/26/11 15:11:02
		04/26/11 15:11:02		04/26/11 15:06:36	04/26/11 15:11:33

Thruput Stream	Seed	Query Start Time	Query End Time	Duration (sec)	RF1 Start Time	RF1 End Time	RF2 Start Time	RF2 End Time
1	426124649	04/26/11 15:11:35	04/26/11 15:31:14	1,179	04/26/11 15:11:35	04/26/11 15:14:18	04/26/11 15:14:18	04/26/11 15:15:16
2	426124650	04/26/11 15:11:35	04/26/11 15:31:42	1,207	04/26/11 15:15:16	04/26/11 15:16:56	04/26/11 15:16:56	04/26/11 15:17:39
3	426124651	04/26/11 15:11:35	04/26/11 15:31:29	1,195	04/26/11 15:17:39	04/26/11 15:19:24	04/26/11 15:19:24	04/26/11 15:20:05
4	426124652	04/26/11 15:11:35	04/26/11 15:31:34	1,199	04/26/11 15:20:05	04/26/11 15:21:49	04/26/11 15:21:49	04/26/11 15:22:32
5	426124653	04/26/11 15:11:35	04/26/11 15:30:10	1,116	04/26/11 15:22:32	04/26/11 15:24:22	04/26/11 15:24:22	04/26/11 15:25:02
6	426124654	04/26/11 15:11:35	04/26/11 15:32:02	1,228	04/26/11 15:25:03	04/26/11 15:28:20	04/26/11 15:28:20	04/26/11 15:29:36
7	426124655	04/26/11 15:11:35	04/26/11 15:31:53	1,218	04/26/11 15:29:36	04/26/11 15:31:15	04/26/11 15:31:15	04/26/11 15:31:54



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TPC-H Timing Intervals (in seconds)

Duration of stream execution:

Stream ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Stream 00	10.6	3.0	2.6	0.9	9.1	0.8	5.2	8.0	46.1	22.3	4.7	2.7
Stream 01	80.8	9.7	7.3	1.7	37.1	5.4	20.4	33.6	297.2	41.0	22.9	20.3
Stream 02	77.6	6.9	4.7	2.8	26.2	0.9	22.4	29.2	307.2	42.1	12.7	16.8
Stream 03	69.7	7.2	6.2	3.0	40.8	6.1	28.1	30.7	242.3	51.2	12.9	9.0
Stream 04	181.8	8.8	23.1	3.5	33.3	3.0	21.4	19.6	242.5	48.7	15.3	17.1
Stream 05	45.3	23.2	6.3	4.1	26.2	5.0	73.2	34.1	243.1	46.5	13.7	8.2
Stream 06	97.4	110.3	11.1	2.9	23.7	7.9	36.6	39.0	160.8	53.6	19.2	14.0
Stream 07	88.6	7.0	6.9	3.5	122.1	1.5	28.0	31.6	162.9	71.4	28.7	13.7
Minimum	10.6	3.0	2.6	0.9	9.1	0.8	5.2	8.0	46.1	22.3	4.7	2.7
Maximum	181.8	110.3	23.1	4.1	122.1	7.9	73.2	39.0	307.2	71.4	28.7	20.3
Average	73.6	19.9	7.9	2.6	36.4	3.5	26.7	26.0	194.2	44.3	15.0	11.6

Stream ID	Q13	Q14	Q15a	Q16	Q17	Q18	Q19	Q20	Q21	Q22	RF1	RF2
Stream 00	40.7	5.9	3.6	8.2	6.4	20.0	21.6	8.0	29.3	6.4	79.6	31.2
Stream 01	179.8	24.8	12.2	43.8	48.1	87.0	40.1	32.6	68.5	64.9	163.0	58.2
Stream 02	171.6	31.3	10.0	90.5	40.8	115.8	57.2	33.6	72.1	35.1	100.2	43.0
Stream 03	106.8	26.8	10.8	69.4	81.9	61.4	152.5	36.5	119.9	21.7	105.3	40.4
Stream 04	106.6	30.8	25.8	64.1	27.2	52.2	101.3	21.6	128.2	23.6	104.6	42.6
Stream 05	181.0	15.5	10.9	58.6	51.9	95.2	34.8	48.6	68.4	21.9	110.1	40.5
Stream 06	192.2	36.7	15.6	62.7	52.0	82.6	61.5	24.6	49.4	73.9	197.3	75.8
Stream 07	189.5	16.4	8.8	75.0	50.8	70.3	54.1	59.6	58.9	68.8	98.9	38.9
Minimum	40.7	5.9	3.6	8.2	6.4	20.0	21.6	8.0	29.3	6.4	79.6	31.2
Maximum	192.2	36.7	25.8	90.5	81.9	115.8	152.5	59.6	128.2	73.9	197.3	75.8
Average	146.0	23.5	12.2	59.0	44.9	73.1	65.4	33.1	74.3	39.5	119.9	46.3